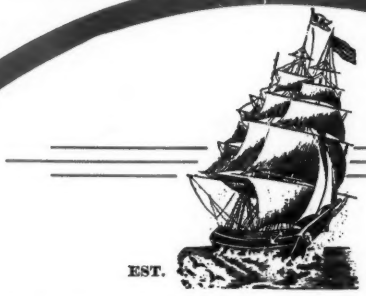
The American Fertilizer

Vol. 92 APRIL 13, 1940 No. 8



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Published every other Saturday. Annual subscription: In the United States, $3.00; Canada and Mexico, $4.00; other countries, $5.00. Entered as second-class matter, January 15, 1910, at the Post Office at Philadelphia, Pa., under Act of March 3, 1879. Registered in United States Patent Office. Publication office, 1330 Vine St., Phila., Pa.

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See Page 27

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Vol. 92 APRIL 13, 1940 No. 8

Soil Fertility the Basis of Farm Chemurgy*

By VINCENT SAUCHELLI

Director of Sales Research, The Davison Chemical Corporation, Baltimore, Maryland

YOU all have heard the story about the young book agent and the farmer: The young book agent was working a good farm area in Central Indiana. Approaching a farm-house, he spied the farmer relaxing in a hammock on the front porch:

"Mr. Jones," he began, "here's something I know you will want. It will put money in the bank for you" . . . And so saying he shows him the book he is selling.

"A fine practical book on scientific farming. Written by one of the best authorities in the state" . . . and so on with his sales talk. The farmer listened good-naturedly and then:

"My good fellow, what do I want with such a book? I'm not farming *now* half as good as I know how."

A large percentage of farmers do know more about scientific farming than they can put into actual practice. Why don't they? we may ask. Because in a great many cases these farmers do not have the money with which to put their knowledge into operation.

I talk to many farmers in all parts of the country. I find a very large number knows that sub-marginal land should not be cropped, that steeper slopes should be terraced and strip-farmed, that more units of live-stock should be kept, that the pastures should be improved, and that lime and higher grade fertilizers should be used more liberally to reduce production costs and conserve moisture and fertility. They know these things are sound; but, lack of money keeps them from doing some or all these things. Like the farmer in the story, they are not farming half as good as they know how.

The Federal AAA program now provides grants-in-aid to farmers. This help enables them to put into effect many sound practices. The policy is in a way a recognition by the Government that it is in the best interests of the nation to subsidize good soil conservation practices and other things which science and good husbandry teach, but which until now have been out of the farmers' financial reach.

In attaining the objectives of the Farm Chemurgic Council, it was agreed upon at the Second Dearborn Conference that one of the means would be by: "increasing the efficiency of crop production, thus lowering costs and retaining these gains for the producers."

This is a worthy ideal. It is the motivating thought behind Federal and State Agricultural research programs and the policies of industrial groups which serve agriculture. This same desire to help farmers get the most out of their fertilizer dollar has been the motive and spirit behind the considerable research and extensive educational program supported by the organization I represent. Our organization serves farmers in every important agricultural section of this country. It has and is devoting considerable research effort to help these farmers increase their crop producing efficiency and thereby lower costs by providing them with the very latest fertilizer products which modern chemical engineering and fertilizer technology has been able to achieve. It carries its message to farmers directly by a large field staff. It has pioneered in extension work, being the first to use a completely equipped laboratory on wheels to promote soil testing and better fertilizer practices. Because of its close dependence

* A paper read before The National Farm Chemurgic Council, 6th Conference, Chicago, Ill., March 28, 1940.

on farm prosperity, it naturally emphasizes its research in terms of the farmer's economic well-being.

If Farm Chemurgy is to foster industries based on surplus crops from the nation's farms, it is right and proper for the Council to interest itself seriously in the fundamental problems of crop production. Surely, the most fundamental problem is soil fertility. This is, in my judgment, of coordinate importaance with chemurgy itself. For, how can we possibly think of building permanent farm chemurgic enterprises on soils which already are showing the most obvious signs of plant food deficiencies? These evidences of depletion have become more clearly defined and more easily recognizable as a result of coordinated research in the technique of soil and plant-tissue testing. Some of these signs of depletion are so gross that farmers can recognize them without the aid of the laboratory: eroded fields; abandoned farms; lower crop yields and poorer quality; rust in cotton; sand-drown in tobacco; weakened corn stalks that lodge easily, and stunted growth and diseases of live-stock grazed on impoverished pastures—these all tell their story in a manner that every true farmer understands.

No, Farm Chemurgy must be built upon a dependable foundation of high soil fertility—on farm land where at least the equivalent plant foods are returned to the soil as are lost to it when crops and live-stock are sold off that land.

Farmers, unfortunately, neglect too often this vital necessity of replenishing the plant foods removed and sold from the farm. This is particularly true in periods following low crop yields or low prices. It is notorious among tenant farmers. However, even in good years, the average amount of plant food returned to the soil is all too meager, and below the quantity removed by each crop. This has been brought to your attention at previous meetings.

Mr. L. J. Taber, addressing the Second Dearborn Conference on "The Changing Agriculture," referred to soil depletion as follows:

"The American farmer is facing definite changes . . .

"The first great change, the most important of them all, is the change of outlook. Years ago the farmer started out with a wilderness of fertile land, limitless resources, ever beckoning him westward. That has gone, never to return. Therefore, the first change in agriculture is to change from drawing fertility out of the soil to restoring it. It is a change, if you please, from an agriculture of exploitation and waste to an agriculture of conservation. That is going to be startling, and it is going to have a profound effect on costs, as well.

"America has had the most reasonably priced food supply in the history of mankind, and it has enjoyed that food supply below the cost of production for all the years, if we consider the value of the fertility that has already been destroyed or removed in America."

Table 1

Average Annual Yield in Bushels Per Acre of Four Principal Crops of the U. S. in Two Groups of States by Decades

	Corn		Wheat		Potatoes		Oats	
Decade	N. Y. Pa. Ohio Ind.	Va. N. C. S. C. Ga.	N. Y. Pa. Ohio Ind.	Va. N. C. S. C. Ga.	N. Y. Pa. Ohio Ind.	Va. N. C. S. C. Ga.	N. Y. Pa. Ohio Ind.	Va. N. C. S. C. Ga.
1866-1875	34.5	12.3	13.3	7.6	87.0	67.9	28.8	11.3
1876-1885	32.4	12.0	15.1	7.0	79.9	66.2	29.2	11.1
1886-1895	31.9	12.9	15.7	8.0	83.8	69.0	27.6	11.7
1896-1905	36.3	13.4	15.0	8.9	84.1	83.5	31.6	13.7
1906-1915	37.8	14.7	17.1	10.7	92.3	93.2	31.0	17.5
1916-1925	39.1	16.0	16.6	10.8	96.1	109.2	32.6	18.2
1926-1935	35.3	14.6	18.7	12.4	112.3	114.1	29.7	19.9

For many years, soil and crop scientists have raised their voices to deplore the ruinous exploitation of our national soil heritage. Public consciousness has become alert, during the past five years, to the waste and vicious force of soil erosion, thanks to the good work of the Soil Conservation Service. However, there are other destructive forces operating, often the forerunners to soil erosion, which are responsible for considerable waste. I shall refer to these briefly to support what was said previously about the more obvious signs of lowered soil fertility.

Let us first consider the tabulated data in Table I, prepared by Dr. W. H. Ross of the U. S. Department of Agriculture, Fertilizer Research Division. The group of South Atlantic States represents large consumers of commercial fertilizers; the mid-western states are

only moderate users of fertilizers. During the first decade (1866-1875) very little fertilizer was used in both groups.

The Evidence of Crop Yields

With the exception of the potato yields, it seems at first reading, that yields of these major crops have kept up satisfactorily and that all the shouting about soil depletion is so much hooey.

During this 70 year period, however, many improved methods have been developed and adopted to a large extent in these agricultural areas. Among these are tiling for better drainage; improved crop varieties which are better adapted and yield heavier; more lime and fertilizers used during the past 30 years, at least; better handling and use of farm manure; the use of legumes in the rotation; the more widespread use of farm machinery; the better understanding of seasonal planting and when to harvest crops for bigger yields; improved methods for controlling insect pests and diseases; and better land use.

In a recent study of this identical problem, Mr. R. M. Salter and associates at the Ohio State University, concluded that "taken together, all these changes and improvements should have raised acre yields considerably—how much, it is difficult to say, but we believe an increase of 40 to 60 per cent would have been conservative. . . .

"There can be but one explanation for the stubbornness with which acre yields have resisted the farmers' efforts to improve them. *The natural productive capacity of the land has been deteriorating at a rate almost fast enough to offset all of these improvements in soil and crop management.* With every step ahead, we have slipped back almost, if not quite, as far."

The Evidence of Soil Deterioration

These same investigators also made direct chemical and physical examinations of different soil types in Ohio to determine the evidence of soil deterioration. They sampled comparable virgin and cropped land, and, using soil nitrogen as an index, showed that cropped land loses heavily in soil nitrogen (Table 2). Nitrogen is a constant part of organic matter and serves as a good measure of the amount contained in the soil organic matter.

As an average for seven virgin soils in Ohio, the cropped soils showed about 33 per cent loss of nitrogen. Most of these soils had been cropped for only about 50 to 75 years, a comparatively short period.

Taken together, the data in these two charts and the observations just cited reveal a condition that cannot be ignored. Soil deterioration is wide-spread throughout our agricultural areas. Our soils today are not as productive as they were 50 years ago. Soil fertility is not being restored fast enough for the best efficiency in crop production and lower production costs.

Table 2

Nitrogen Content of Comparable Virgin and Cropped Soils in Ohio

(Bulletin 175—Ohio Agri. Ext. Service)

Soil Type	County	Nitrogen contained in one acre of Surface Soil — Virgin Pounds	Cultivated Pounds	Loss — Pounds	Per Cent
Toledo silty clay	Fulton	5,900	3,300	2,570	43.6
Brookston stilty clay loam	Miami	7,750	4,050	3,700	47.8
Crosby silt loam	Miami	3,330	2,760	570	17.2
Wooster loam	Summit	2,925	1,600	1,325	45.4

New Developments in Fertilizer Practices

So much for the dark side of the picture. I do not want to stress it unduly. We must see it, however, to appreciate what is being done to improve and to brighten the agricultural picture.

We are passing through a transitional period. Changes appear everywhere. The many new developments in plant nutrition, biology and economics as they apply to our agriculture are so numerous it is hard to do full justice to them in the limited time allotted. A few deserve mention.

First among these is fertilizer placement. During the decade, 1928-1938, a coordinated research program embracing 146 experiments at 70 locations in 27 states with 29 different crops was carried through by the National Joint Committee on Fertilizer Application and its cooperators. The purpose was to determine how to apply fertilizers so as to get maximum value in crop yields commensurate with the investment. It had been realized for a long time that much plant food was being applied haphazardly, resulting in waste of money, time and in higher production costs. The combined efforts of the fertilizer industry, fertilizer equipment manufacturers, farmers, and research agencies of many Federal and State agricultural experiment

(Continued on page 24)

March Tag Sales

March fertilizer sales, as indicated by the sale of tax tags, amounted to 1,640,000 tons in the 17 reporting States. This represented an increase of 4 per cent over March, 1939, and about the same increase over March, 1938. Sales were below March, 1937, but with that exception were the largest for the month since 1930.

Aggregate sales in the South exceeded last year by 4 per cent the result of increases in seven States and declines in five. The largest drop was reported by North Carolina, where a reduction in tobacco acreage has taken place. The effect of this has not been fully offset by a reported increase in cotton acreage. Largest gains took place in Mississippi, Arkansas, Louisiana, and Texas.

Three of the five Midwestern States reported larger sales in March than a year earlier, but these increases in Kentucky, Missouri, and Kansas were more than offset by declines in Indiana and Illinois. The result was a small recession in total sales in the area.

Total tonnage in the 12 Southern States in the January-March period was up 3 per cent from the corresponding period of last year. Virginia, North Carolina, Tennessee, and Oklahoma reported smaller sales but each of the other eight registered a gain. The increase has been most pronounced in the west south central area but Oklahoma has not shared in the upturn.

The course of tag sales in the December-March period has not seen much change in the past three years, with sales around the three million ton level. In view of the importance of tobacco as a fertilizer using crop in the area covered by tag sales and of the decline in tobacco acreage, the increase in tonnage over last year, although small, is especially significant.

Economic conditions are generally favorable to increased fertilizer sales this spring, with prices for farm products and farm income well above last year. The U. S. Department of Agriculture recently stated, "The relatively high level of cash income from farm marketings in January and February is expected to continue during the next three months." In addition to larger income from marketings farmers are also getting more from Uncle Sam, with Government payments in January-February totaling $224,000,000 against $96,000,000 in the same two months of last year.

FERTILIZER TAX TAG SALES*

Compiled by The National Fertilizer Association

1926-1928 = 100

	March				January-March			
	1940		1939	1938	1940		1939	1938
	Per Cent of 1939	Tons	Tons	Tons	Per Cent of 1939	Tons	Tons	Tons
SOUTH:								
Virginia†	91	79,549	87,674	87,458	94	167,783	179,193	187,527
N. Carolina	88	316,098	358,252	378,387	88	558,312	634,533	626,507
S. Carolina	112	298,265	226,468	289,101	108	444,380	411,679	463,045
Georgia	99	319,616	322,062	319,451	105	478,883	454,785	504,866
Florida†**	119	53,656	45,032	46,111	105	176,007	167,989	177,809
Alabama	100	199,150	199,700	172,700	104	312,950	301,600	278,900
Mississippi	147	108,675	73,825	106,150	140	196,013	139,600	155,131
Tennessee†	97	23,456	24,250	25,526	84	39,682	47,461	47,239
Arkansas‡	148	36,000	24,300	15,400	130	66,200	50,900	43,250
Louisiana†	129	57,825	45,000	48,729	110	102,311	93,050	99,917
Texas†	148	43,455	29,389	24,856	130	77,016	59,034	56,387
Oklahoma	111	2,320	2,089	1,465	86	5,173	6,018	6,115
Total South	104	1,538,065	1,478,041	1,515,334	103	2,624,710	2,545,842	2,646,693
MIDWEST:								
Indiana	93	54,225	58,482	34,338	120	113,019	94,295	69,376
Illinois	81	7,164	8,832	7,119	78	12,507	16,026	11,794
Kentucky	106	22,786	21,585	16,942	98	40,111	41,008	44,220
Missouri	122	16,608	13,655	13,525	127	23,826	18,765	24,218
Kansas	150	918	610	344	180	2,368	1,315	3,029
Total Midwest	99	101,701	103,164	72,268	112	191,831	171,409	152,637
Grand Total	104	1,639,766	1,581,205	1,587,602	104	2,816,541	2,717,251	2,799,330

* Monthly records of fertilizer tax tags are kept by state control officials and may be slightly larger or smaller than the actual sales of fertilizer. The figures indicate the equivalent number of short tons of fertilizer represented by the tax tags purchased and required by law to be attached to each bag of fertilizer sold in the various states.

† Cottonseed meal sold as fertilizer included.

‡ Excludes 13,700 tons of cottonseed meal for January-March combined, but no separation is available for the amount of meal used as fertilizer from that used as feed.

** Includes 11,360 tons of phosphatic and lime materials for January-March.

The Hills and Valleys of Phosphate Fixation*

By GEORGE D. SCARSETH

Soil Chemist, Purdue Agricultural Experiment Station, Lafayette, Indiana

WHY Worry About Available Phosphate? No person would be satisfied to deposit $10 in a bank that would only allow $2 or $3 to be withdrawn. Yet, we are not greatly concerned when plants can use only 20 to 30 per cent of the phosphate added to soils in an available form in fertilizers. The balance of the phosphate becomes locked up in the soil so tightly that nature actually uses this fact in accumulating the phosphate ore deposits of the world. The phosphate minerals are so much more insoluble than the other minerals in the original rocky parent materials, that the phosphate minerals are left behind as residues when many of the other rock minerals have weathered away through the thousands of passing years.

Since soils have the peculiarity of wasting phosphorus by locking or fixing soluble phosphates into unavailable forms, we like to know what can be done about releasing it. In order to know what can be done to decrease fixation, it is necessary to understand the mechanism by which the fixation takes place.

* Reprinted from "Better Crops with Plant Food," March, 1940.

Where Are Phosphates Locked Up in the Soil?

If a soil were pure sand and contained no clay particles, there would be no fixation of soluble phosphates, because the fixation takes place only in the clay part of the soil. This means that the heavy clay soils will tie up phosphates faster and to a greater extent than light-textured soils. This also means that phosphate-carrying fertilizers will go farther and last longer in sands than in clays. However, since most soils contain from 20 to 30 per cent of clay, the behavior of the clay towards the phosphates becomes very important.

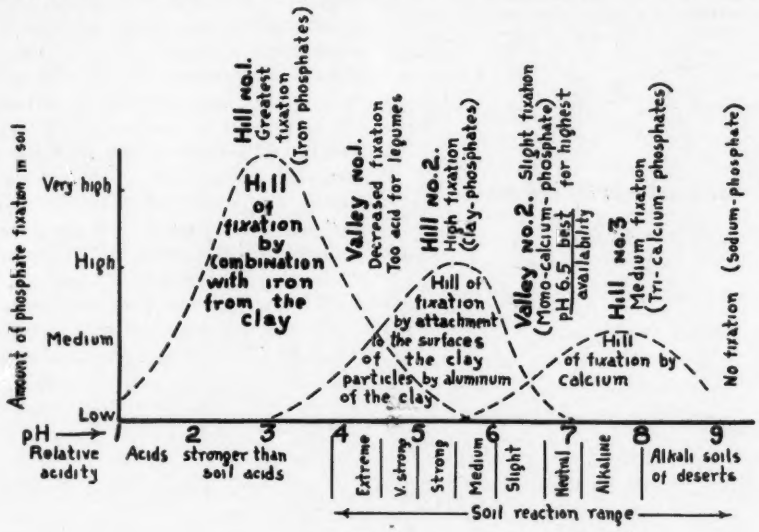
Amount of phosphate fixation in soil
Very high
High
Medium
Low
Hill no.1. Greatest fixation (Iron phosphates)
Hill of fixation by combination with iron from the clay
Valley no.1. Decreased fixation Too acid for legumes
Hill no.2. High fixation (Clay-phosphates)
Hill of fixation by attachment to the surfaces of the clay particles by aluminum of the clay
Valley no.2. Slight fixation (Mono-calcium-phosphate) pH 6.5 best for highest availability
Hill no.3 Medium fixation (Tri-calcium-phosphates)
Hill of fixation by calcium
No fixation (Sodium-phosphate)
pH → Relative acidity
Acids stronger than soil acids
Extreme
V. strong
Strong
Medium
Slight
Neutral
Alkaline
Alkali soils of deserts
Soil reaction range

FIG. 1.

The Behavior of Phosphates in Soils

Much research has been done to learn how phosphates behave in soils. The diagram (Fig. 1) sums up the most important relationships that exist between the complexities in the clays of the soil and phosphates as affected by the different degrees of acidity in the soil. (The acidity is expressed in terms of pH.)

The diagram is made up of actual experimental curves that express definite relationships.

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THE AMERICAN FERTILIZER
ESTABLISHED 1894
PUBLISHED EVERY OTHER SATURDAY BY WARE BROS. COMPANY
1330 VINE STREET, PHILADELPHIA, PA.

A MAGAZINE INTERNATIONAL IN SCOPE AND CIRCULATION DEVOTED EXCLUSIVELY TO THE COMMERCIAL FERTILIZER INDUSTRY AND ITS ALLIED INDUSTRIES
PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

WARE BROS. COMPANY
PUBLISHERS
1330 VINE STREET PHILADELPHIA, PA.
A. A. WARE, EDITOR

ANNUAL SUBSCRIPTION RATES

U. S. and its possessions, also Cuba and Panama.....$3.00
Canada and Mexico..... 4.00
Other Foreign Countries..... 5.00
Single Copy..... .25
Back Numbers..... .50

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April Crop Report

April 1st reports show light crops of winter wheat and rye in prospect, pastures a little late but with about average prospects ahead, fruits in about average condition notwithstanding some winter injury and the general crop and moisture situation not greatly different from the average at this season during recent years but somewhat less promising than in decades prior to 1933.

Prospects for crops, pastures, and ranges appear good to excellent rather generally west of the Rockies and in Montana as a result of favorable winter and spring rains and mild weather. Prospects were quite uneven, averaging only fair, in most of Great Plains area where a large acreage of winter wheat failed because of drought last fall and where prospects for spring sown crops are somewhat clouded by the lack of subsoil moisture even though most areas, except western Kansas and southeastern Colorado have a fair supply of surface moisture at present. The Cotton Belt and the early vegetable areas of the Southeast suffered from a severe winter. Crops and pastures there have a late start but as yet the lateness is not serious. While there was some damage to fruits in the South the condition of southern peach trees is still above average and prospects for the 1940 crop of citrus fruits in Texas and Florida do not appear to have been much reduced by the cold weather.

In nearly the whole northern area east of the Missouri River, March was cold, and up to April 1st the spring was late but winter grains and meadows appear to have been little damaged by the severe cold of January. Most fruit trees in this area also escaped with little damage up to April 1st but from Missouri eastward into Ohio many peach buds were injured.

On the basis of conditions as they were on April 1st, the United States winter wheat crop is estimated at 426 million bushels. This is about 27 million bushels more than seemed probable last fall but it would be about 145 million below the 10-year (1929-38) average and nearly as much below production last year. Since the expansion of wheat production during the World War only two winter wheat crops have been smaller. Rye, like winter wheat, suffered from drought last fall. The usual acreage could not be planted and the condition reported on April 1st averaged 69 per cent, the lowest for the date in more than 60 years with the exception of 1934.

DATES FOR N. F. A. ANNUAL CONVENTION

The Sixteenth Annual Convention of the National Fertilizer Association will be held on June 3rd, 4th, and 5th, at the Greenbrier Hotel, White Sulphur Springs, West Virginia. Details of the program will be announced later. Reservations should be made by communicating directly with the hotel management.

FERTILIZER COMPANIES MUST SHOW RECORDS

The grand jury investigation of the fertilizer industry, which has been proceeding for several weeks in the Federal Court at Winston-Salem, N. C., has reached a new stage. Some time ago, the government issued subpoenas to a number of fertilizer companies requiring them to produce voluminous records, relating to fertilizer production, sale and distribution. Attorneys for the companies moved to quash these subpoenas on the grounds that they were too broad and indefinite and constituted unreasonable search and seizure in violation of the Federal Constitution.

After several weeks' consideration, Judge Hayes announced on March 30th that he had overruled the motion but issued an order limiting the subpoenas in some details. The order states that if the moving companies "will make available, in their home and branch offices, to two of the Attorney General's staff in charge of this investigation, the documentary evidence called for in the subpoena in order to eliminate the production of any record not deemed by them essential, the court will enter an order accordingly. . . . In the very nature of the case and the voluminous records, much of it could be eliminated at the office and avoid crating, shipping, and the disruption of the office files."

VIRGINIA FERTILIZER LAWS AMENDED

An amendment to the fertilizer law of Virginia has been signed by the Governor. This amendment was first proposed as House Bill 214. The changes provide for the guarantee of nitrogen only as total nitrogen, water insoluble nitrogen, and nitrate nitrogen if claimed, but not less than one-half of 1 per cent of nitrate nitrogen may be claimed. The package must contain a statement as to whether the fertilizer is acid-forming or non-acid-forming. A tolerance of 100 pounds calcium carbonate equivalent is provided. Total magnesium oxide and water soluble or available magnesium oxide must be guaranteed if claimed. The original bill provided for a 16 per cent minimum of total plant food content, but this was changed and the minimum plant food content remains at 14 per cent. That part of the amendment relating to acid-forming and non-acid-forming fertilizers becomes effective January 1, 1941. The rest of the amendment becomes effective January 1, 1942.

House Bill 23, which provides that all dead animals being transported to fertilizer factories or soap establishments must be carried in closed containers, or in an enclosed truck or vehicle, has also been signed by the Governor.

CHANGES IN MISSISSIPPI FERTILIZER LAW PROPOSED

House Bill 651, introduced in the Mississippi legislature, proposes to amend the fertilizer control law by requiring a statement on the tag or bag as to whether the fertilizer or material is "acid-forming" or "non-acid-forming" with a tolerance of 50 pounds calcium carbonate per ton. No fertilizer material or combination of materials may be sold unless the degree of availability of the nitrogen or phosphoric acid or potash has been approved by a majority of the Commissioner of Agriculture, the State Chemist, and the Director of the Mississippi Experiment Station. Notice of each shipment must be sent to the Commissioner within 24 hours, giving brand, formula or name of material, number of bags and weight, and name and address of consignee.

The bill has been passed by the House with the following amendment: To the section providing that the phosphoric acid in bone meal, phosphate rock, and other products where the phosphoric acid is not readily available, may be guaranteed as total phosphoric acid, the following clause is added: "But in each case the tag shall contain the further statement that such product is not a substitute for superphosphate nor designed to be used as such."

A new section providing for a list of standard grades is provided as follows: "Section 4. On or before the first day of November of each year the Commissioner of Agriculture, State Chemist, and Director of Mississippi Experiment Station shall publish and furnish to fertilizer manufacturers and guarantors a list of the fertilizer grades and fertilizer materials to be registered and sold in the State for the following year."

"Starter" Solutions for Tomatoes*

By Charles B. Sayre

The experiments with "starter" solutions for transplanting tomatoes were continued and enlarged in 1939. As in previous experiments, the mixture of 2 parts of ammo-phos 11-48 and 1 part of nitrate of potash was particularly effective.

In the 1939 experiments a comparison was made of increasing concentrations of this mixture and decreasing amounts of water. Growers who do not have an easily obtainable supply of water convenient to the fields in which they expect to plant tomatoes will be gratified to know of the results. In these tests the biggest increase in early and total yields of tomatoes was obtained with a more concentrated solution and a very small amount of solution per plant. Using 8 pounds of this special transplanting mixture dissolved in 50 gallons of water and applying ¼ pint of this solution per plant gave the best results. In this test the tomatoes were set 3 feet apart in rows 5 feet apart. This requires 2,904 plants per acre. At ¼ pint of "starter" solution per plant this requires only 91 gallons per acre.

This treatment increased the yield of early tomatoes (harvested by August 31) by 1.45 tons per acre as compared with plants grown under identical conditions except that they received plain water instead of a "starter" solution when they were transplanted.

This rate of application required 14½ pounds of the special transplanting mixture per acre. In 1939 this mixture retailed at 5½ cents per pound in most sections of the State. Thus the cost of the materials was only 80 cents per acre. Another mixture which gave good results was made up of equal parts of mono-potassium phosphate and di-ammonium phosphate. Three pounds of this mixture contain as much phosphoric acid as 5 pounds of the other mixture and may be used in that ratio. Last year this mixture was quite expensive, but the price has been greatly reduced for 1940 and it can be bought now at about 11 cents per pound. This material dissolves easily in water and leaves no residue.

What the Tests Show

Reports of many farmers who tried the "starter" solution agreed with our experimental results and supported the following conclusions in regard to the results obtained from the use of a "starter" solution in transplanting tomatoes:

1. The plants become established quicker and resume growth earlier.
2. This results in earlier maturity.
3. Fewer plants have to be replaced.
4. Gains are particularly marked where southern-grown plants or very crowded locally grown plants are used. Abundantly fertilized pot-grown or widely spaced greenhouse-grown plants, such as are commonly used by market gardeners for very early market are not likely to show any response from the "starter" solution when transplanted.

The "starter" solution has also given excellent results in transplanting cabbage, peppers, eggplants, and melons. For cabbage 5 pounds of the special mixture per 50 gallons of water and ¼ pint per plant gave better results than greater concentrations. For mellons, peppers, and eggplants 4 pounds of the mixture per 50 gallons of water is recommended.

Any "starter" solution is not a substitute for field fertilization but should be used as a supplement to the regular field fertilization to get the plants established quickly.

* Reprinted from "Farm Research," April, 1940, published by the New York Agricultural Experiment Station.

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FERTILIZER MATERIALS MARKET

NEW YORK

Better Interest in Materials as Season Gets Under Way. Sulphate of Ammonia Very Scarce. Organic Prices Tend to Be Lower.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, April 9, 1940.

In spite of the continued unseasonable weather in the east and middle west, there has been a little more interest in fertilizer materials. In certain parts of the south, fertilizer is moving rapidly and it is felt that at the first signs of fairly settled weather throughout the country there will be real activity.

There has been slightly better demand for the general run of raw materials within the last few weeks but the demand for organics has been very slight.

Sulphate of ammonia is very scarce and quite a few of the fertilizer manufacturers who are in urgent need of this material have had to pay prices well above the schedule to obtain material for shipment within the next three or four weeks.

Nitrate of Soda

Price remains the same at $27.00 in bulk, $28.30 in 200-lb. bags and $29.00 in 100-lb. bags, port basis.

Sulphate of Ammonia

Price schedule of $28.00 per ton, basis ports, still prevails but no new commitments can be made at this figure.

Castor Pomace

The market on this material has weakened considerably and serious buyers probably purchase this commodity at the ports at which stocks are maintained at around $2.35 per unit of ammonia ($2.85½ per unit N).

Nitrogenous Material

Domestic nitrogenous is weaker and bids of $2.30 ($2.79½ per unit N), delivered usual ports, could probably be worked. Foreign nitrogenous has also weakened to some extent but is not competitive with domestic material at the present time.

Fish Scrap

The market on Japanese fish meal continues firm at $52.00.

Potash

This market remains firm at 53½ cents per unit K_2O, in bulk, basis ex vessel with ample supplies available.

Superphosphate

The market is unchanged at $8.50 per ton for run-of-pile material.

Triple Superphosphate

The Government has requested bids on additional 40,000 tons of this material for shipment through October. Previous bookings have been for shipment through August so that it is possible that additional quantities may be offered to the Government if manufacturers decide to fix their prices at this time for this later delivery.

Dried Blood

This material is offered at New York at $2.70 ($3.28 per unit N), with South American available at $3.00 ($3.64½ per unit N) for shipment.

BALTIMORE

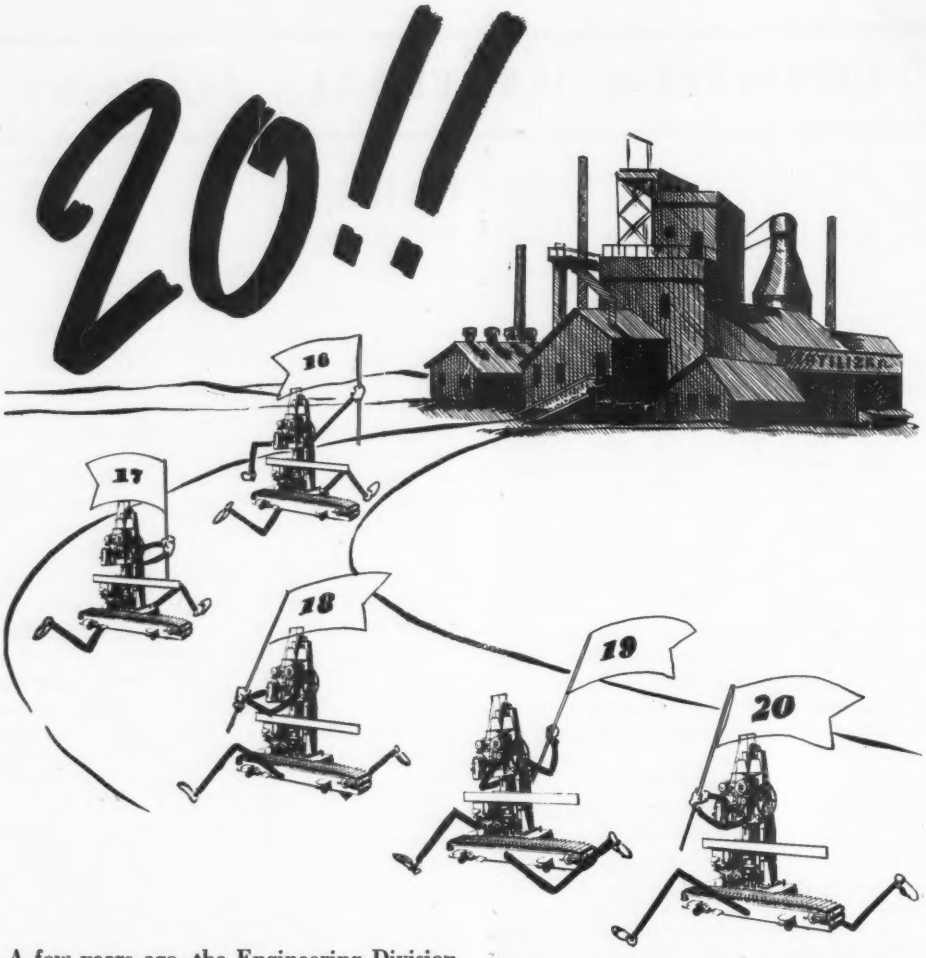
Manufacturers Busy with Spring Shipments. Sulphate of Ammonia Supply Far Below Present Demand.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, April 9, 1940.

The spring shipping season has at last gotten under way and all manufacturers are now devoting their time and attention to getting out their orders, in consequence of which there has been practically no interest shown in re-sale materials.

Ammoniates.—There has been a slacking-up in the demand for tankage for feeding purposes, with result that the market is ruling somewhat easier around $3.50 per unit of nitrogen and 10 cents per unit of B.P.L., f.o.b. Baltimore, with offerings somewhat more plentiful. How-



A few years ago, the Engineering Division of one of the country's largest chemical companies approved the purchase of their first Bagpaker. As proof that the recommendations of these engineers were well founded, this company just recently installed their 20th Bagpaker.

This forcibly demonstrates the fact that the Bagpak* Method gives packaging results. Bagpak Paper bags lower the initial *container cost*; Bagpaker machines lower the *packaging cost*. Result: a lower net cost per ton of material packed.

Bagpak offers a complete packaging service. Mechanically perfected Bagpaker machines speedily and economically weigh, fill, close and seal your material in multiwall paper bags; or perform any part of the packaging cycle desired. Our engineering and development staffs are available to you without obligation.

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ever, this price is still out of reach for fertilizer purposes.

Nitrogenous Material.—In view of the lack of demand for these goods, the nominal market has been reduced, and is now $2.90 per unit of nitrogen, but even on this basis there is very little interest being shown.

Sulphate of Ammonia.—The peak demand of the year is now on and is far in excess of production, and as many of the producers are running behind in their deliveries, there is quite an acute shortage at the present time. There is practically no re-sale material offering, although it would be possible to secure a premium of, at least, $5.00 per ton over schedule. Some of the manufacturers have been compelled to resort to the use of other materials to take the place of sulphate in their mixtures, in view of the shortage which has developed, and will probably continue throughout the balance of the spring season. It is also reported that a better export demand is making itself felt and this will doubtless play an important part in the market after the fertilizer season is over.

Nitrate of Soda.—Deliveries are now being made in more seasonable volume, but no change in price is anticipated over the balance of the season, in view of previous announcement by importers of the Chilean product that current prices of $29.00 per ton of 2,000 lb., in 200-lb. bags, f.o.b. port warehouse would prevail, irrespective of market conditions.

Fish Meal.—In view of the easier tendency of the market on tankage and meat meal, it is anticipated that the market on fish meal will be affected, although the present market is firm at $58.00 per ton of 2,000 lb., in bags, f.o.b. Baltimore, guaranteed 55 per cent protein, and there are no heavy stocks being carried over by sellers.

Superphosphate.—The market on this commodity continues unchanged, and producers are firm in their views of $8.50 per ton of 2,000 lb., basis 16 per cent, for run-of-pile, and $9.00 for flat 16 per cent grade, both in bulk, f.o.b. Baltimore, which prices will probably continue throughout the remainder of the spring season.

Potash.—There has been practically no activity in this commodity as stocks in warehouse are ample to take care of current season's requirements. As first hands have been able to fill all orders, there has not been any re-sale demand.

Bone Meal.—The market remains quiet and 3 and 50 per cent domestic steamed bone meal is still quoted at $32.00 to $35.00 per ton, while 4½ and 47 per cent South American raw bone meal ranges from $30.00 to $32.00 per ton, c.i.f. Baltimore, but practically no business passing.

Bags.—The market on burlap is ruling slightly firmer and the present price of plain, new, 10-oz. bags is about $112.00 per thousand, basis 40 cut 54 in., delivered Baltimore.

CHICAGO

Fertilizer Materials Market Quiet With Prices Slightly Lower. Feed Market Slow.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, April 8, 1940.

The situation remains very quiet, most buyers being more interested in their spring shipping than in the purchase of materials. Meanwhile, sellers are showing no undue selling pressure but asking prices are slightly lower than those ruling recently. Supply of bone meal is still scarce, though demand has now fallen off.

Trading in feed materials has been slow but sellers are in fairly well sold positions.

Nominal prices are as follows: High grade ground fertilizer tankage, $2.35 to $2.40 ($2.85½ to $2.91½ per unit N) and 10 cents; standard grades crushed feeding tankage, $2.65 to $2.75 ($3.22 to $3.34½ per unit N)

Manufacturers' Sales Agents for **DOMESTIC**

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Ammonia Liquor :: Anhydrous Ammonia

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Nitrate of Soda

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Both Guaranteed
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Valuable not only as a source of nitrogen, but also to help maintain the supply of other plant food elements *naturally* blended with it.

Enjoy the Uncle Natchel program every Saturday night on WSB, WRVA and WSM, and every Sunday afternoon on WIS, WPTF, WBT, KWKH, WJDX, WMC, WWL, WAGF, WDBO, WSFA, WJRD, WJBY.

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and 10 cents; blood, $2.65 to $2.75 ($3.22 to $3.34½ per unit N); dry rendered tankage, 67 to 72 cents per unit of protein, Chicago basis.

WILMINGTON

More Fertilizer Being Shipped By Rail. Some Materials Scarce. More Cotton, Less Tobacco Being Planted.

Exclusive Correspondence to "The American Fertilizer."

WILMINGTON, April 8, 1940.

The movement of mixed goods to the agents and farms is now in full swing. The increase in the rail movement as against the truck movement is very noticeable this year, indicating that the reduction in rail freights has accomplished quite a bit and saved considerable money for the farmers.

Organics continue to show weakness, probably due to the reduction in tobacco planting and the absence of the usual fill-in orders that come at this time of the year. Cottonseed meal maintains its levels with tenacity, however, and fish is very hard to obtain.

Sulphate of ammonia has been bringing a premium, due to slow deliveries from production points and the lack of the usual foreign arrivals.

Potashes are in light demand. Muriate is being offered from resale sources at the potash list less 5 per cent.

It is believed that the increase in cotton acreage this year over last will compensate to some extent for the loss in tonnage due to the tobacco limiting. However, it is not expected that the total tonnage will equal that of last year.

TENNESSEE PHOSPHATE

Fertilizer Shipments Continuing in Quantity. Phosphate Rock Mines and Plants Active. Prices Show Downward Trend.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., April 8, 1940.

Beautiful spring weather has again been in evidence and truckloads of fertilizer from the factories in Nashville and other points north are passing through here on the way south, and similar truckloads from Florence, Birmingham and other points south going north.

Shipments of rock in all consuming channels continue with great vigor and movement of matrix and rock from mines to the large furnace plants is active. Shipments of ground rock for direct application for March, 1940, ex-

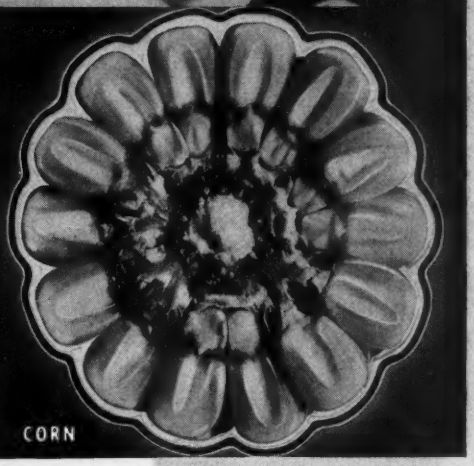
SUNSHINE STATE

POTASH

FOR SPRING PLANTING

COTTON

TOBACCO



CORN

IN the Spring, a farmer's thoughts turn to planting crops. And the first step in the growing of quality and quantity crops is an adequate use of proper grade fertilizer containing the right quantity of Potash.

Cotton, corn, and tobacco, as well as many other crops, are benefited by fertilizer containing Sunshine State Potash, specified to fit local conditions of soil and climate.

Fertilizer producers know the right formula for the right job. They like Sunshine State Potash because of its consistently uniform analyses of Muriate of Potash and Manure Salts, and the careful sizing that makes handling and blending easy.

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62/63% K_2O Also 50% K_2O Grade

MANURE SALTS
Approximately 30% K_2O

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ceeded any movement for same month since 1930 and April for the first week is far ahead of same period in 1939.

Nearly two thirds of the TVA production of treble superphosphate was used in Kentucky alone last year and it looks like this year will be as large. Much if not most of it is reported as being used with soil-depleting crops and the complaint of the fertilizer salesman is that the farmers who actually use it correctly, get their fertilizer paid for in benefit payments, while those who use it incorrectly, while they get no benefit payments, do not have to pay for it at all, or at least do not think they will have to, which makes hard competition for the fellow trying to sell something for money.

All the mines and plants, including he large electric furnaces producing elemental phosphorus, three near Columbia, three at Mt. Pleasant and three at Muscle Shoals, are in active operation and the stock piles which loomed so large in early January have melted to insignificant proportions.

Wholesale prices of crude phosphate rock for furnaces and for fertilizer manufacturers are feeling the tendency in a downward direction from the necessity of the rock ordinarily exported from Florida being dumped still more widely on the domestic market, but, if the war continues six months, in all probability highest prices for many years will be in evidence.

ATLANTA

European War Situation Complicates Market Trend. Current Price Level Probably Will Advance.

Exclusive Correspondence to "The American Fertilizer."

ATLANTA, April 9, 1940.

New overnight developments in the international situation as of today are causing considerable apprehension and speculation as to the ultimate result.

While the fertilizer season here in this country is too far advanced to be affected to any appreciable extent by current happenings, the far reaching effect of any untoward developments in Europe will have a vital effect on the future economy of this country and the world.

Nobody seems to know what the answer is and it will probably be months before a clearer picture can be had. Certain it is that commodity prices are in a favorable position if they are to be measured by the yardstick of the past.

A careful survey of the market on fertilizer ingredients discloses the fact that, for the most part, prices are no higher than they were last summer before the war. There may be a few exceptions but they are in the minority. It would seem, therefore, if in the judgment of those far sighted individuals this war is going to continue for some time to come, that there is hardly any chance of going wrong by risking future supplies at current levels.

Quotations are as follows:

Tankage.—Imported, $3.25 ($3.95 per unit N) and 10 cents; domestic, $2.75 ($3.34½ per unit N) and 10 cents, Chicago.

Nitrogenous Tankage.—$1.80 ($2.19 per unit N), western producing points.

Blood.—Imported, $3.20 ($3.89 per unit N), c.i.f.; domestic, $2.90 ($3.52½ per unit N), Chicago.

Nitrate of Soda.—No change from schedule.

Sulphate of Ammonia.—Unchanged, with producers well sold up and spot stocks scarce.

Fish Meal.—Menhaden: acidulated fish, $2.50 ($3.04 per unit N) and 50 cents, producing points; meal, $46.00; dry scrap, $43.00.

Raw Bone Meal.—4½ and 45 per cent, $31.50.

Steam Bone Meal.—3 and 50 per cent, $29.00, c.i.f.

Cottonseed Meal.—Prime 8 per cent, Memphis, $29.00 to $30.00. Southeastern mills, $31.00.

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"URAMON" fertilizer compound was first introduced to the fertilizer trade three seasons ago to meet the demand for a dry form of urea nitrogen suitable for use in mixed fertilizers and improved top-dressers. During this short time, "URAMON" has established itself as an important source of fertilizer nitrogen.

The industry was previously aware of the economy and efficiency of urea nitrogen, which the Du Pont Company had made available in the form of Urea-Ammonia Liquors.

Urea nitrogen, whether supplied in Urea-Ammonia Liquors or "URAMON," is especially adapted for use in mixed fertilizers because it is

1. **Completely available**
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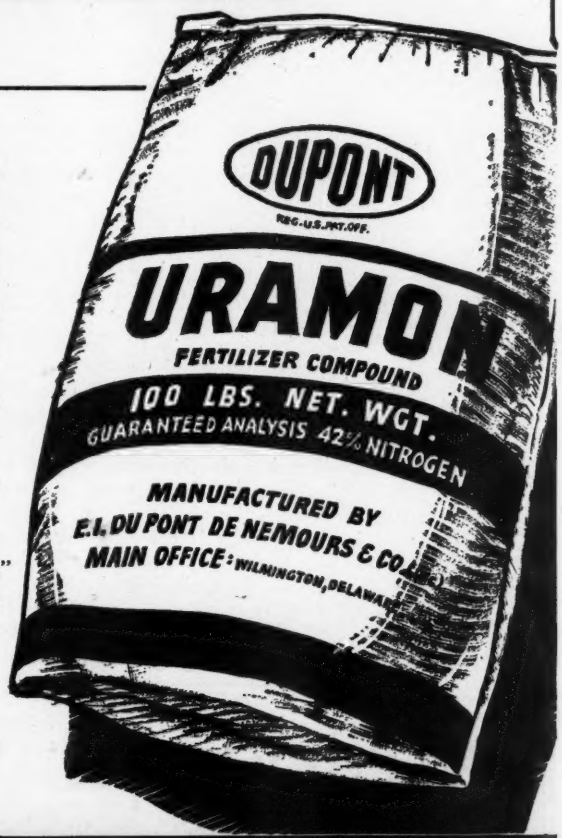
3. **Low in equivalent acidity**

It combines the best qualities of both soluble and insoluble forms.



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THE HILLS AND VALLEYS OF PHOSPHATE FIXATION

(Continued from page 9)

To understand these curves best, think of them as hills that overlap one another as shown in the figure, with valleys formed in the spaces where the hills fail to overlap. The higher the hill the greater the fixation capacity, and the lower the hill, or deeper the valleys, the less the relative fixation. The diagram needs to be studied carefully and is then self-explanatory.

Phosphates Can Be Made More Available in Soils

It is obvious that the phosphate has the best chance to be of the highest availability in the soil at the slightly acidic reaction of pH 6.5. This is one of the reasons why it is so important to correct strong acidity by liming the soil.

The phosphates that are fixed, as shown in "Hill No. 2" of the diagram, by being fastened (adsorbed) to the surfaces of the clay particles by aluminum in the clay particle, can be made available by an exchange reaction with certain other substances, as humate-ions from humus. Thus, when plant matter decomposes to form humus in the soil, the humate part of the organic matter will push the fixed phosphate-ion off the clay and leave it in an available form. The humate-ion will attach itself to the clay where the phosphate-ion had been fixed. In this manner, organic matter favors the more favorable behavior of phosphates in soil that are acid between pH 5.0 and 6.0.

Organic matter will cause "Hill No. 3" to be lowered by the action of carbon dioxide (CO_2) that is given off by the bacteria when rotting the organic matter. The CO_2 thus formed is a weak acid (carbonic acid, which is the same as carbonated water in the soda fountain) which acts upon the fixed tri-calcium phosphates of "Hill No. 3" to convert the phosphate into forms available to plants. (Roots give off CO_2 that dissolves also some of the tri-calcium phosphates.) This action of CO_2 does not help much in the acid ranges below pH 6.0.

Since phosphates are rapidly fixed, they do not leach out readily or move much in the soil. To offset this fact, phosphate fertilizers should be applied in frequent applications (every year) and not depend on infrequent, large applications to supply the phosphate needs of the plants for 3 or more years. The available phosphate-carrying fertilizers should not be mixed too thoroughly into the soil, since thorough mixing increases the contact between the phosphates and the fixation-components in the soil. Adding the available phosphates (superphosphate) in narrow bands in the soil at the side of the seed is usually best.

Rock phosphate is frequently used as a source of phosphate. Its availability depends upon many factors. In general this form of phosphate works best (1) when added in large amounts to soils that are slightly acid (pH 6.0) and mixed throughout the soil; (2) with rotations containing legumes adequately fertilized with potash. If rock phosphate is used to favor legumes in the rotation, superphosphate should still be used in the mixed fertilizers for wheat corn, and other row crops.

PROGRESS IN ITALIAN FERTILIZER INDUSTRY

According to the official Italian business report, the Italian demand for phosphatic fertilizers has increased heavily and now stands around 1,500,000 metric tons per annum. Among nitrogenous fertilizers, sulphate of ammonia is to the fore with 230,000 metric tons in 1938, a quantity 47.50 per cent higher than the average used in the previous 5 years. The use of calcium cyanamid has increased by 7 per cent, that of nitrate of ammonia (39,600

NITROGANIC TANKAGE

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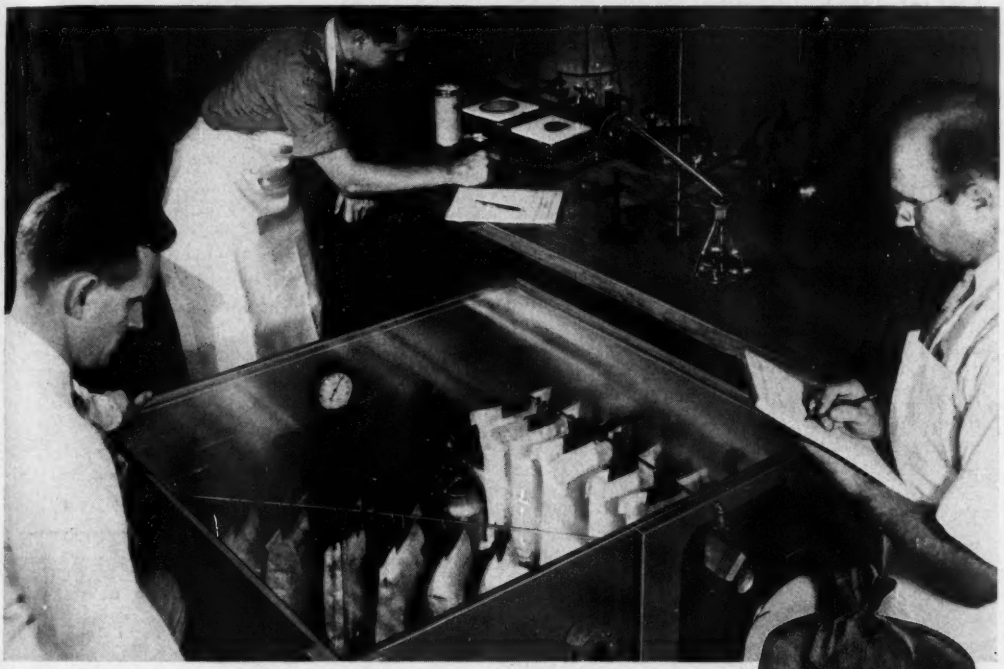

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Mark for the attention of _____

metric tons) by 51 per cent, that of calcium nitrate (149,700 metric tons) by over 52 per cent.

The Italian output of fertilizers is steadily increasing but does not yet fully cover the requirements of the home market. No fewer than 271 firms are engaged in the business, employing over 21,000 workers. Of these, some 80 factories produce phosphatic fertilizers; the plants have a potential output approximating 2,000,000 metric tons per annum, and use raw material imported from Morocco, Tunis, and Egypt.

MICHIGAN FERTILIZER SALES IN 1939

Michigan fertilizer sales in 1939 amounted to 144,811 tons according to the summary prepared by Professor C. E. Millar of Michigan State College on the basis of reports submitted by fertilizer companies. This compares with 132,702 tons in 1938 and 144,500 tons in 1937. High analysis fertilizers are increasing in sales in the state. In 1939, 93.3 per cent of the tonnage of mixed goods was of grades containing 20 per cent or more of plant food while the similar ratio in 1938 was 89.0 per cent. The leading grade, 2-12-6, accounted for 53.5 per cent of total mixed goods tonnage while the first 5 grades accounted for 70.7 per cent. Less than 50 tons were sold of each of 19 grades. The 2-12-2 grade is steadily declining in importance.

	1938	1939
2-12-6	61,143	66,278
2-16-8	4,983	7,093
2-12-2	6,154	5,929
2-8-16	4,604	4,432
4-16-4	4,316	3,933
51 other grades	32,265	36,249
Total mixed goods	113,465	123,914
Superphosphate: 16%	592	175
20%	13,377	14,208
45%	316	421
Total	14,285	14,804
Other materials	4,952	6,093
Total tonnage	132,702	144,811
Spring sales	90,902	98,566
Fall sales	41,800	46,245

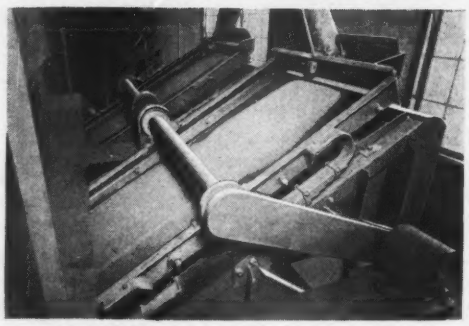
DUSTING PEANUTS WITH SULPHUR

According to experiments that have been carried on at the North Carolina Experiment Station during the past three years, the dusting of peanuts with sulphur has returned an average profit of $6.60 per acre. The work was carried on by Dr. R. F. Poole, Dr. Luther Shaw, M. M. Evans, and Howard R. Garriss. They recommended three or four applications of sulphur dust at the rate of 16 to 30 pounds of sulphur per acre at each application. The cost of sulphur will be approximately $2.50 per acre. Any type of dusting equipment that will throw out a good fog of the dust material will be satisfactory. The first application should be made between July 5 and 15, and followed by three others at as nearly two-week intervals as possible. The increased yield for three applications in 1939 was 459 pounds of nuts per acre and with four applications 509 pounds. During the past three years, 53 demonstrations were conducted in 13 counties, and the average profit for dusting was $6.60 per acre.

I. A. C. DROPS RECAPITALIZATION PLAN

It has been announced by the officers of the International Agricultural Corporation that the proposed plan of recapitalization, which was to have been acted upon at a special meeting of the stockholders, has been dropped. It is understood that a new plan is being proposed which will be presented to the stockholders when completed. In the meantime, the company has called for redemption on May 1st, at 103 and interest, its entire issue of $4,500,000 first and collateral 5 per cent bonds.

VIBRATING SCREENS by LINK-BELT



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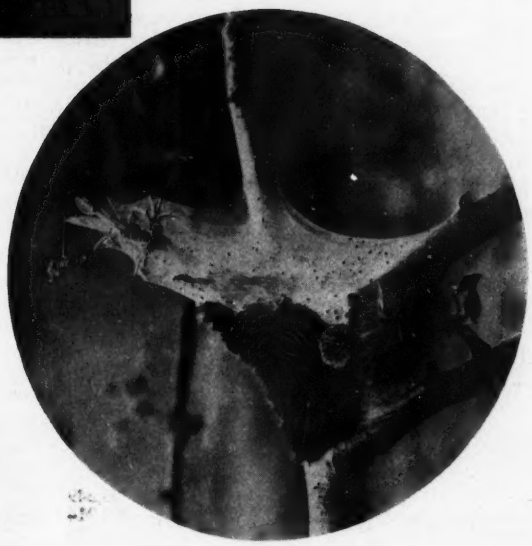
SULPHUR AND ITS DESTINY



Killing the Killers

Caterpillars sure are pests and the best place to put them out of commission is in the "tent" before they start despoiling the trees.

Tests show that dusting with specially prepared Sulphur or spraying them with Sulphur suspended in water effectively kills these killers.

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FEBRUARY EXPORTS AND IMPORTS

Exports of fertilizers and fertilizer materials from the United States during February amounted to 53,398 long tons, according to figures published by the National Fertilizer Association. This is a drop of 37 per cent from the February, 1939, figures, and of 51 per cent from February, 1938. The principal decline was in phosphate rock due to war conditions. This February, foreign shipments came to only 16,708 tons, compared with 62,068 tons in February, 1939, and 93,081 tons in February, 1938. Exports of ammonium sulphate amounted to 12,088 tons while the figures for the two preceding February's were only 437 and 70 tons respectively. Potash exports totaled 475 tons during February.

In contrast with exports, imports during February increased to 147,975 long tons, an advance of 33 per cent over 1939 and 4 per cent over 1938.

The principal change from last year in the nitrogenous group was a drop in sodium nitrate imports; imports of all other nitrogenates were about the same as in February, 1939. Imports of potash salts were comparatively large, 65,486 tons. All of the potash imports for the month came from France with the exceptions of potassium-sodium nitrate mixtures, which were brought from Chile, and a small shipment of sulphate of potash reported as coming from Hungary.

EXTRA FERTILIZER VALUE IN NORTH CAROLINA

The North Carolina Department of Agriculture reports that during 1939 they analyzed 5,174 samples of fertilizers and fertilizer materials. In the case of all but 5 of the smaller companies, the average valuation of the fertilizers tested exceeded the guarantees, the overage ranging from 1 cent to $5.23.

The average commercial value of the fertilizer was found by these analyses to be 81 cents a ton more than the value guaranteed. During the year, 1,215,890 tons of fertilizer and fertilizer materials were sold in the State. On the basis of the State's inspection, the farmers of the State received $984,870.90 worth of plant food more than they paid for. Only 291 of the 5,174 samples analyzed were penalized for deficiencies, and the total of all penalties, which are from two to four times the actual deficiencies, was only $2,993.91 and only a little over one hundredth of 1 per cent of the value of the fertilizer sold.

SOIL FERTILITY THE BASIS OF FARM CHEMURGY

(Continued from page 7)

units have demonstrated in a convincing way that *how* a fertilizer is applied may very often exceed in importance the quantity and the ratio of the fertilizer. Band placement of fertilizer is now generally the recommended practice.

One of the by-products of this group research, in a way, has been the introduction of new fertilizer drills and other farm implements designed to facilitate the placement of fertilizer in the precise location relative to seed or plant to promote maximum yields. The Farm Chemurgic Council can well afford to give its support to all efforts leading to a wider adoption of machine placement of fertilizers. Too many farmers are using old, inefficient fertilizer equipment.

During the past decade, agronomists and influential farm leaders have labored with the problem of fertilizer composition. Chemical science has made available many new sources of plant food. The Federal Government has contributed much to these developments. The results concern particularly nitrogen carriers, since nitrogen is such an important cost item in all fertilizers. Today agronomists are generally agreed that so-called water-insoluble organic forms of nitrogen are not superior to the water-soluble or inorganic forms. The latter are considerably cheaper, too.

Rapid Soil Tests

Rapid chemical tests are being perfected to determine the productive capacity of a soil as measured by available mineral nutrients, contents of organic matter, and by the soil reaction. While these methods have not been accepted officially in all states, they have, nevertheless, won wide acceptance and are proving very helpful to those responsible for fertilizer

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recommendations. Plant tissue tests should also be mentioned as an important ally in the more intelligent and economical use of fertilizer.

Mention must be made of the progress in grade reduction. Fewer grades, with higher plant food content, is another way to help reduce the cost of fertilizers to farmers.

The subject of so-called secondary and minor plant food elements really deserves more than just a mention. Suffice it to say that during the past five years our knowledge of the importance of these chemical elements has been enormously enlarged. We all appreciate much better now their function in crop growth. However, we still need better chemical methods for detecting deficiencies of these minor elements in both soil and plant tissues.

Physical Properties of Fertilizer

Last, but by no means least, we mention the progress made, particularly in the last five years, in the physical properties of fertilizer. One way to lower the cost of fertilizer to the farmer is by increasing its efficiency without proportionately increasing its price. This efficiency can be increased in many ways; for example, by distributing the fertilizer uniformly in the row, by improving its drillability, by preventing segregation of its component ingredients, and by insuring its precise placement with respect to the seed or plant.

Fertilizers cannot be uniformly distributed if they become sticky or lumpy; if the ingredients tend to segregate when handled; or if the drillability is poor as in the case of materials of small particle size. It is known that a finely divided material promotes caking because of the tremendous surface exposed to the humidity of the air, and this in turn can impair drillability. A mixture of finely divided particles and large particles will invariably undergo segregation when subjected to the motions and vibrations of a fertilizer distributor.

Fertilizer Application

One of the projects of The National Joint Committee on Fertilizer Application studied the effect of fertilizer distribution on germination, spacing of plants, earliness of bloom and crop yields. This comprehensive study led to the following conclusion[1]:

"Any additional expense that might be incurred by the farmer in obtaining proper equipment, or by manufacturers in refinement of fertilizer distributors, and in improvement of the drillability of fertilizers to secure uniform distribution would undoubtedly be small compared to the benefits that might be expected. Uniform application of fertilizers produces a more rapid and uniform growth, earlier bloom, and larger yields."

To obtain all these major benefits by improving the physical properties of fertilizers has been the aim of private and Federal research. The research has led to the granulation of fertilizers as the most effective way to realize these benefits. To quote Dr. W. H. Ross and J. O. Hardesty of the U. S. Department of Agriculture, Fertilizer Research Division[2]:

"Granulation of fertilizer mixtures reduces caking, prevents segregation, improves the drillability of the mixture, decreases handling charges, eliminates the necessity of using high-priced conditioners, and by bringing about a rapid cooling of the mixture, prevents the loss of plant food that results when ammoniated mixtures containing dolomite are stored in large piles at an elevated temperature."

In conclusion, The Farm Chemurgic Council can be of great help in promoting the application of existing knowledge to the replenishment of soil fertility so as to maintain our crop lands to the highest level of fertility, compatible with maximum crop yields. This is as important as the industrial utilization of surplus crops. It can help very considerably by emphasizing through its news releases and its other news channels how important it is for the farmer and the industrialist to become familar with the new developments in plant food research, the new materials, fertilizer placement, up-to-date mechanical equipment, and the more efficient granulated products of fertilizer technology.

These are all parts of the brighter side of the agricultural picture and deserve careful study and vigorous promotion.

[1] U. S. Dept. Agr. Journal of Agricultural Research, April 1, 1932.

[2] Year Book of Commercial Fertilizer, 1937.

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See Page 4

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For Alphabetical List of Advertisers, see page 33.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
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ACID EGGS
Chemical Construction Corp., New York City.

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Chemical Construction Corp., New York City.
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AMMONIA LIQUOR
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Chemical Construction Corp., New York City.

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BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

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CAL-NITRO
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Stedman's Foundry and Mach. Works, Aurora, Ind.

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Wellmann, William E., Baltimore, Md.

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GEARS—Silent
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Sturtevant Mill Co., Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
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Stedman's Foundry and Mach. Works, Aurora, Ind.
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Stedman's Foundry and Mach. Works, Aurora, Ind.
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MACHINERY—Pumping
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MACHINERY—Tankage and Fish Scrap
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE AND CARBONATE
Tennessee Corporation, Atlanta, Ga.

MANGANESE SULPHATE
Tennessee Corportion, Atlanta, Ga.

MIXERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
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NITROGENOUS ORGANIC MATERIAL
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
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International Agricultural Corp., New York City.
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Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PACKING—For Acid Towers
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Ruhm, H. D., Mount Pleasant, Tenn.
Schmaltz, Jos. H., Chicago, Ill.
Southern Phosphate Corp., Baltimore, Md.
Taylor, Henry L., Wilmington, Del.
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Chemical Construction Corp., New York City.

PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
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POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
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Schmaltz, Jos. H., Chicago, Ill.
Synthetic Nitrogen Products Co., New York City.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers and Importers
American Potash and Chem. Corp., New York City.
Potash Co. of America, Baltimore, Md.
United States Potash Co., New York City.

PULLEYS AND HANGERS
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Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

PUMPS—Acid-Resisting
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Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

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SHOVELS—Power
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
U. S. Phosphoric Products Corp., New York City.
Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Agricultural Corp., New York City.
U. S. Phosphoric Products Corp., New York City.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

TALLOW AND GREASE
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TANKAGE
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
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Smith-Rowland Co., Norfolk, Va.
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Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

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Sackett & Sons Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

UREA
Du Pont de Nemours & Co., E. I., Wilmington, Del.
Snythetic Nitrogen Products Co., New York City.

UREA-AMMONIA LIQUOR
Du Pont de Nemours & Co., E. I., Wilmington, Del.

VALVES—Acid-Resisting
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
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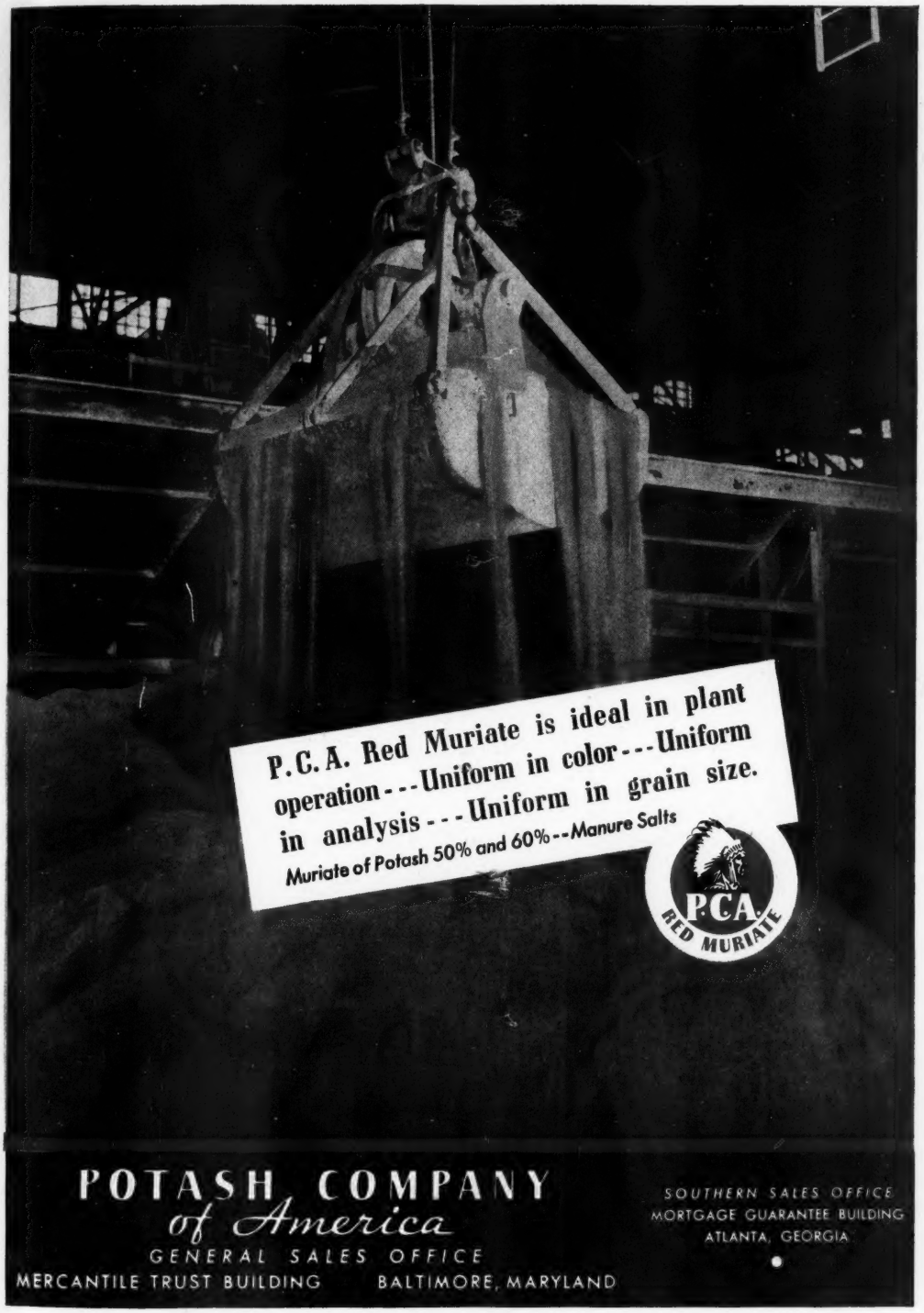
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